

# Waves and Optics - PHY204 (Smaldone - Sassi)



Gulu University

Naples FEDERICO II University

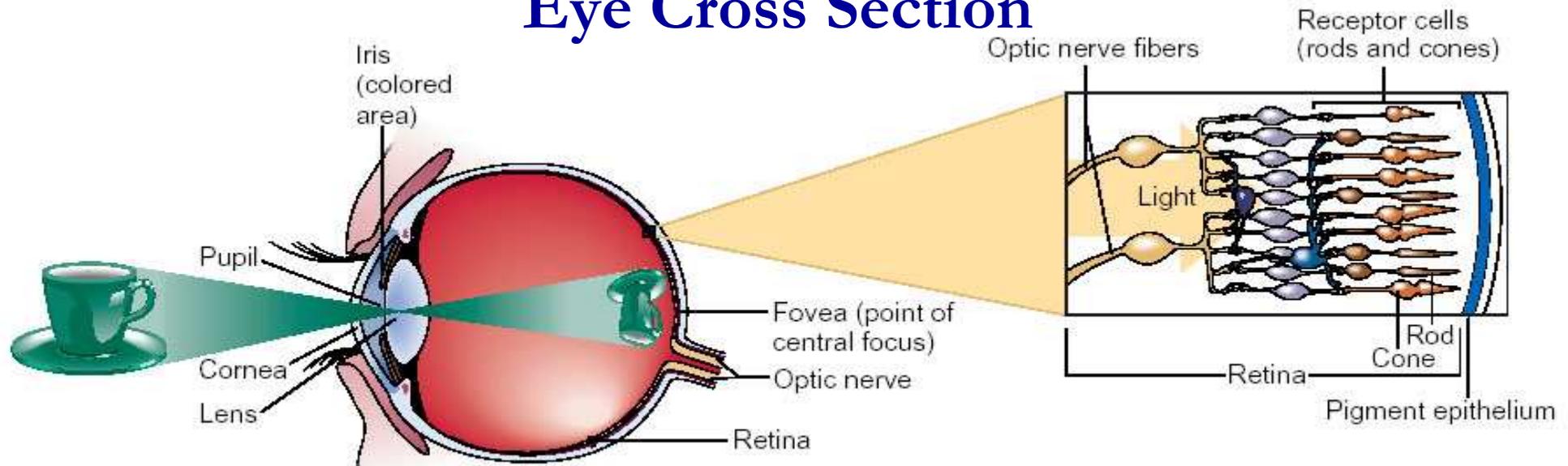


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## Introduction

# Laser Safety -1

## Eye Cross Section



Visible and near infrared optical radiation is focused onto, and absorbed by the retina. Exposure to high intensity light from a source of optical radiation will cause instantaneous damage to the retina because the light source will be focused onto a small number of cells.

**The damage will be permanent, because retinal cells do not regenerate!**

## Laser Safety -2

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### The Danger of Laser Light

**Looking directly into the beam of a low power (1 mW) visible laser can cause considerably more retinal damage than looking directly at the sun!!**

With a laser, the optical energy is contained in a very narrow beam that does not spread out much. Even at relatively large distances, the laser beam spot can still be very small and, thus, the optical energy entering the eye can still be very high.

The almost parallel laser light is focused to a very sharp point on the retina. This means that most of the energy emitted by the laser will be concentrated onto only a few cells on the retina causing maximum damage to those cells.

## Laser Safety -3

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### Minimizing the Danger

**Terminate the beam at the end of its useful path** (i.e., non-reflective beam stop).

**Avoid specular reflection from polished or shiny surfaces.**

**Never look directly into the laser beam.**

**Avoid darkened rooms. Do not set up your laser beam in a darkened room,** as your pupils will enlarge and therefore potentially will let more of the laser beam energy onto the retina.

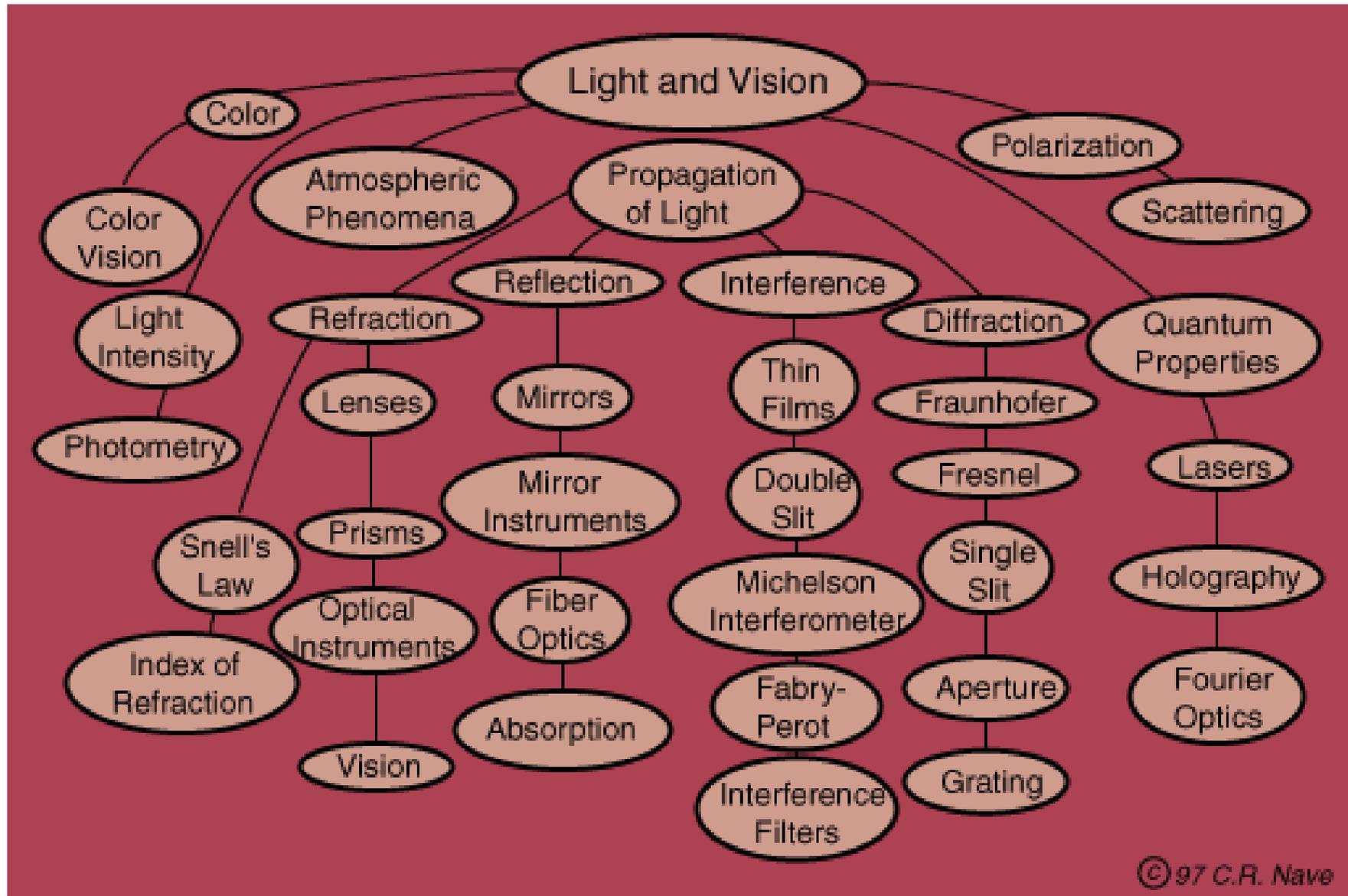
## Laser Safety -4



**Do not play with Laser**

**The batteries ... will be very soon exhausted !**

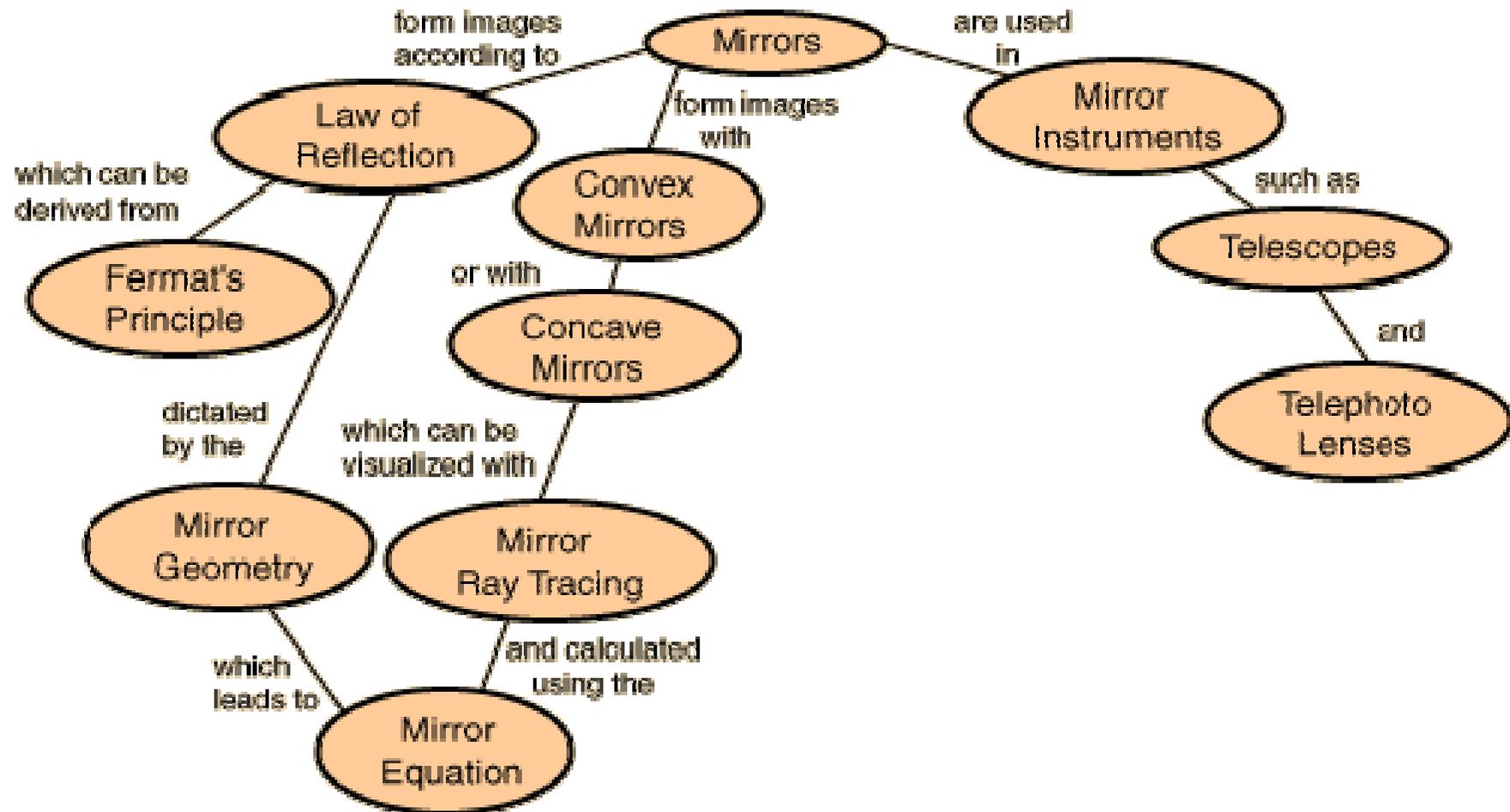
# Optics



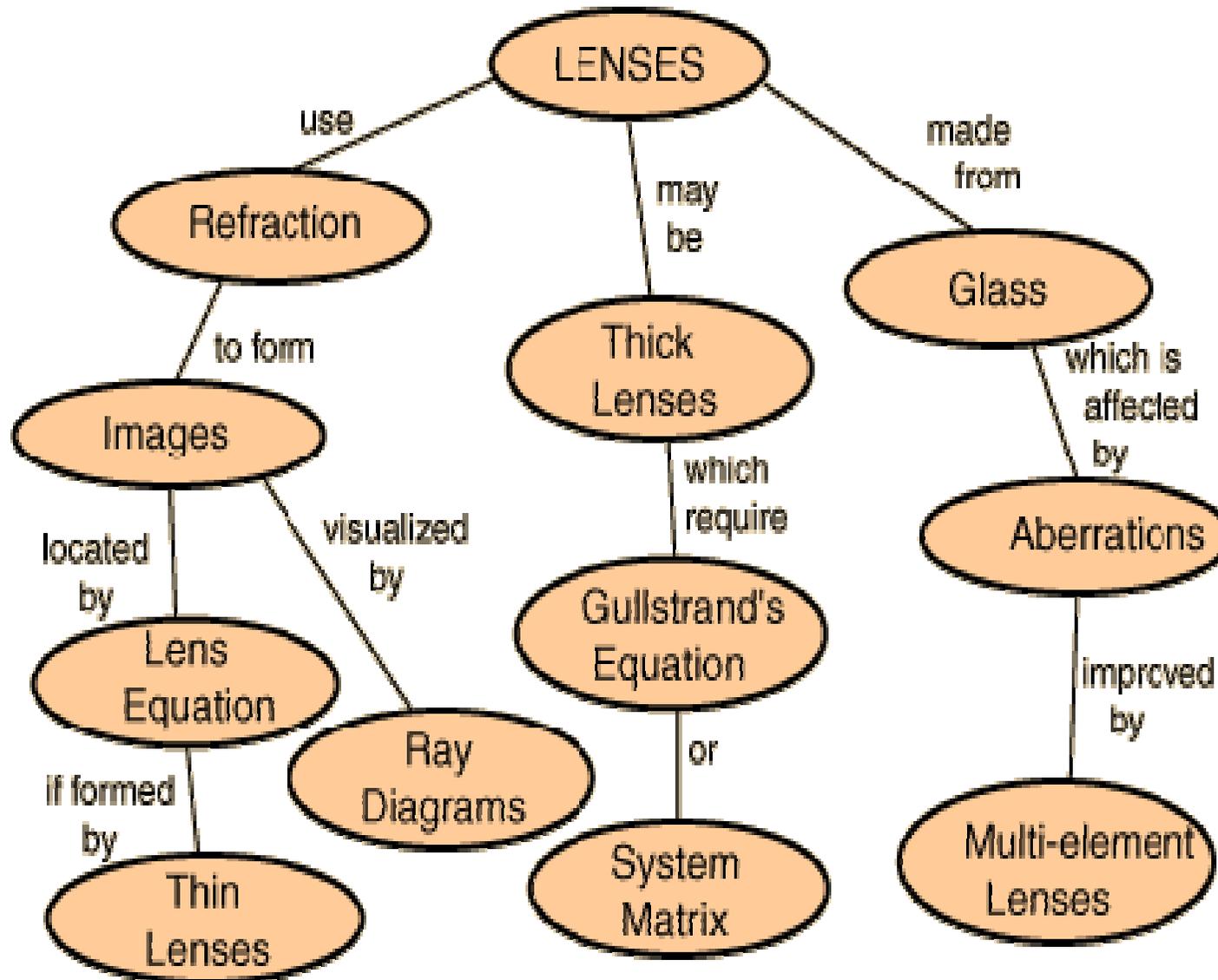
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## 0- Introduction

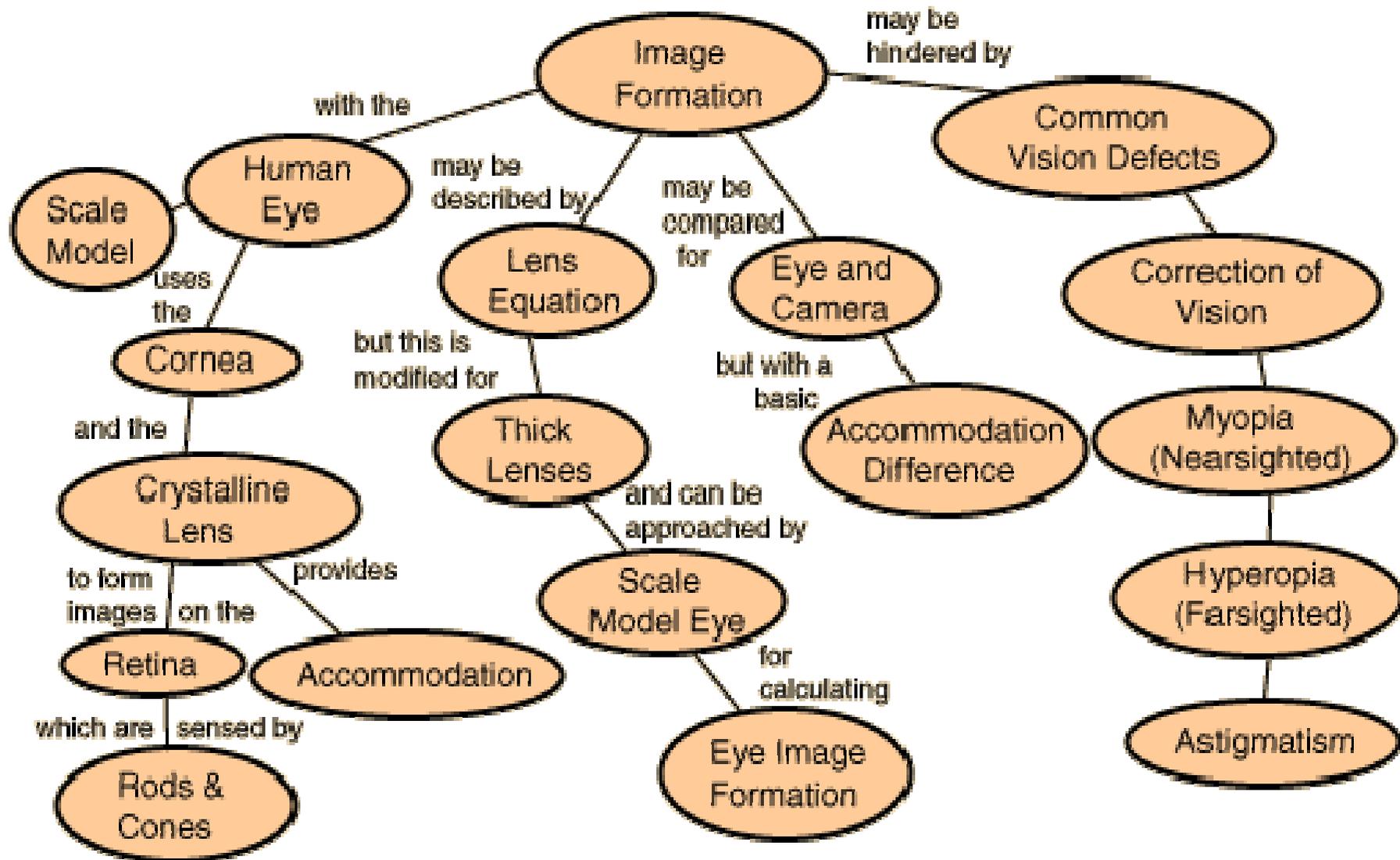
# Mirrors



# Lenses

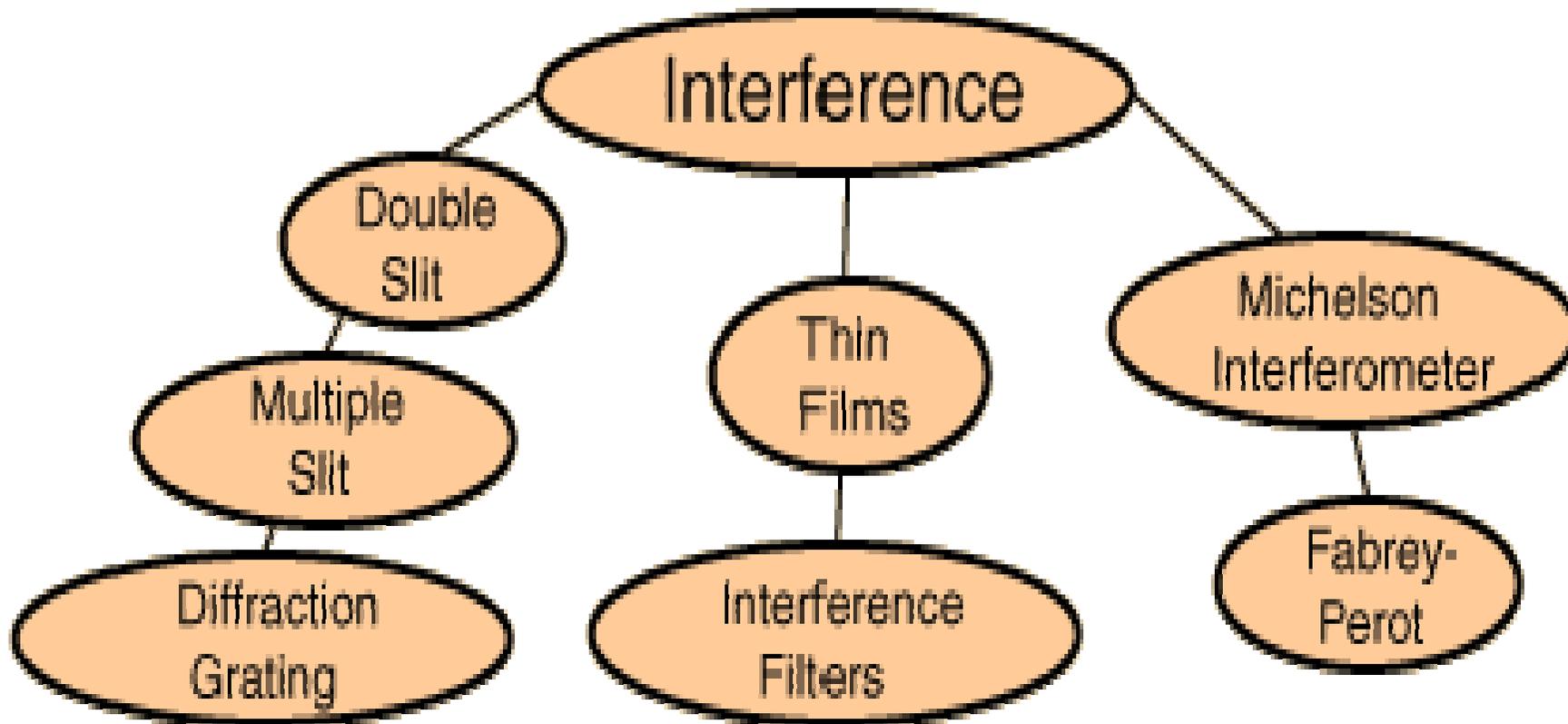


# Image Formation



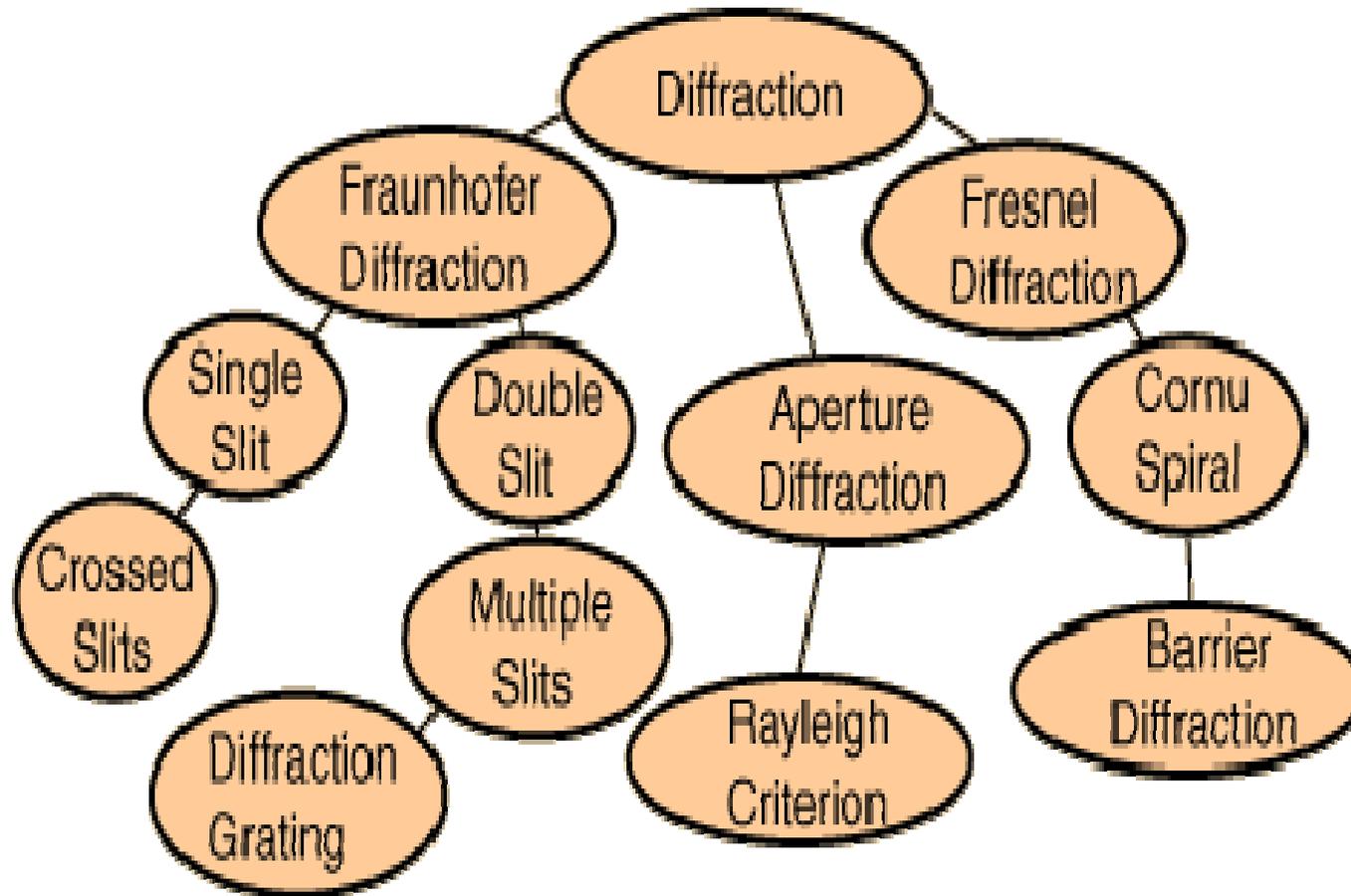
# Interference

When  $1+1$  can range from 4 to 0 !!!



# Diffraction

Diffraction manifests itself in the apparent bending of waves around small obstacles and the spreading out of waves past small openings.



# Polarization

